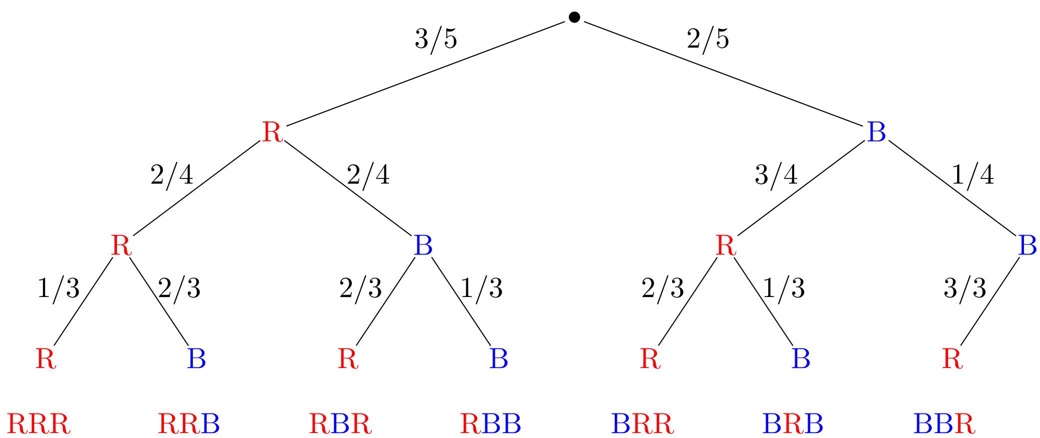
Problem: In an urn we have three red balls and two blue balls. If we draw three balls at random, without putting back a ball we have drawn, what is the probability that we get two blue balls (and thus one red ball)?

Solution: We draw a probability tree to represent the possible outcomes.



Starting at the root, the probability is 3/5 that we draw a red ball first, and 2/5 that we draw a blue ball first. If we draw a red ball first, which corresponds to going down the left edge from the root, then there are two red and two blue balls left, and so it is equally likely that we next draw a red ball and a blue ball. That is why we have 2/4 on both edges going down from the left child of the root.

The rest of the tree is constructed in the same way, with the resulting outcome of each path down from the root displayed at each leaf in the tree. There is no right child on the far right, because at that point we have already drawn two blue balls, and so there are none left (which is why the probability on the single edge is 3/3, or 1).

Looking at the outcomes, we see that three of them have two Bs, namely RBB, BRB and BBR. For each of these outcomes we multiply the probabilities along the edges from the root to that leaf, so for RBB, for example, we get $(3/5) \cdot (2/4) \cdot (1/3)$. All in all, we thus get the following, when we sum up the probabilities for the three outcomes in question:

$$\frac{3}{5} \cdot \frac{2}{4} \cdot \frac{1}{3} + \frac{2}{5} \cdot \frac{3}{4} \cdot \frac{1}{3} + \frac{2}{5} \cdot \frac{1}{4} \cdot \frac{3}{3} = \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{3}{10}.$$